JPRS 74833

28 December 1979

East Europe Report

SCIENTIFIC AFFAIRS

No. 658

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

50272 101

REPORT DOCUMENTATION PAGE	1. REPORT NO. JPRS 74833	2.	3. Recipient's Accession No.

4. Title and Subtitle	5. Report Date
EAST EUROPE REPORT: SCIENTIFIC AFFAIRS, No. 658	28 December 1979
	6.
7. Author(s)	8. Performing Organization Rept. No.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201	10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address As above	13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This serial report contains press and radio coverage on the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences.

17. Document Analysis a. Descriptors

___International Affairs
___Albania
___Bulgaria
___Czechoslovakia
_x_German Democratic Republic
_x_Hungary
_x_Poland
___Romania
___Yugoslavia

Scientific Societies
Research Management
Organizations
Research

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group 5B

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited Availability Sold by NTIS Springfield, Virginia 22161	UNCLASSIFIED	57
	20. Security Class (This Page) UNCLASSIFIED	22. Price

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

JPRS 74833

28 December 1979

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 658

CONTENTS

PAGE

 [III - EE - 65]

GERMAN DEMOCRATIC REPUBLIC

PROCESS COMPUTER TECHNOLOGY DEVELOPMENT REVIEWED

East Berlin MESSEN-STEUERN-REGELN in German Vol 22 No 10, Oct 79 pp 550-554

[Article by Dr H. Willem, engineer, VEB Robotron Combine, Center for Research and Technology, Dresden: "Development of Process Computer Technology in the GDR"]

[Text] Introduction

The use of computer technology within the framework of complex automation systems for technological processes has grown exponentially both on an international scale and in the economy of the GDR.

The first international uses of process computers occurred at the beginning of the 1960s; in the GDR the first practical uses occurred around 1965. Since that time, tremendous efforts and investigations have been under way in all branches of our economy for the manufacture and use of process computers.

The process computer technology coming into use in the economy of the GDR is significantly affected by products from the VEB Robotron Combine (Fig 1).

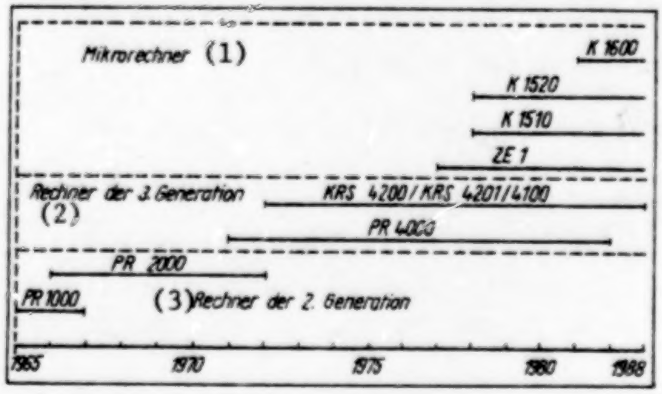

Bild 1. Rechentechnik des VEB Kombinat Robotron für den Einsatz in Automatisierungssystemen

Figure 1: Computer technology of the VEB Robotron Combine for use in automation systems

Key: 1. Microcomputer 2. Third generation computer 3. Second generation computer

With the development of third-generation process computers, a new phase of application was introduced in the GDR. Process computers are used today in all areas of the economy. In addition to use for automation of production processes, process computers are also used to rationalize tasks:

--in science and technology

--in medicine

--in agriculture

--in business

They are also used to rationalize training processes down to monitoring and checking of training results for our top athletes. The use and tasks of process computers have become so diverse that it seems useful to point out important and typical lines of application.

1. Lines of Applications for Process and Minicomputers

The lines of application are characterized by the following qualities:

--uniform systems structure, nearly equal:

--peripheral equipment

--requirement of real time processing

--liability requirements of the total system

--specific requirements of the control program systems

--specific class of tasks and thus specific problem solving; specific class of problem-oriented system documentation.

Proceeding from previous developments in application and equipment technology in connection with system documentation, the following lines of application are found:

1. Automated production controls (APS); whereby it is necessary to divide automatic production control into flow processes and piece processes.

2. Laboratory and test field automation (LPA), in particular equipment control and test evaluation in laboratory and test field automation in industry, medicine research/development and education.

3. Medium-scope scientific-technical and economic calculations (WTOR);

4. Use of minicomputers within large information-processing systems, specifically as Multiplexer and terminals in connection with ESER computers. Use as input/output processes in computers themselves or in peripheral equipment (IVS).

The most important task complexes are pointed up in Figure 2.

2. Employment results attained.

As we see in Figure 1, computers of the Robotron 4000 family are the important basis and therefore all data refer to this technology.

By October 1979, about 1,600 systems of the Robotron 4000 family had been in use. Related to the illustrated lines of application, we have the following relation:

APS 40%

LPA 15%

WTOER 42%

IVS 3%

Use in the framework of automation systems (APS) is process-specific and is as a rule, integrated into control rooms.

Because of the limited reliability of each technical system and due to reliability parameters of the third generation of computers with available peripheral equipment, process computer use usually takes place in addition to conventional technology if the reliability of the system cannot be elevated to a new plataeu by sepcial measures (redundant systems). Through use in control rooms and due to the fact that process computers can only be used on larger technological installations due to economic considerations, a large number of measurement points have to be recorded by a process computer.

Example: Hagenwerder Power Plant 500 MW Block
about 800 analog measurement points
2000 digital measurement points.

This type of concentrated measured value acquisition and processing means that high installation costs will occur since all measured signal lines must be lead to the knodal point (control room--computer.) Naturally, very high reliability is desired from such a system if the production process is to be monitored or controlled by the computer system only.

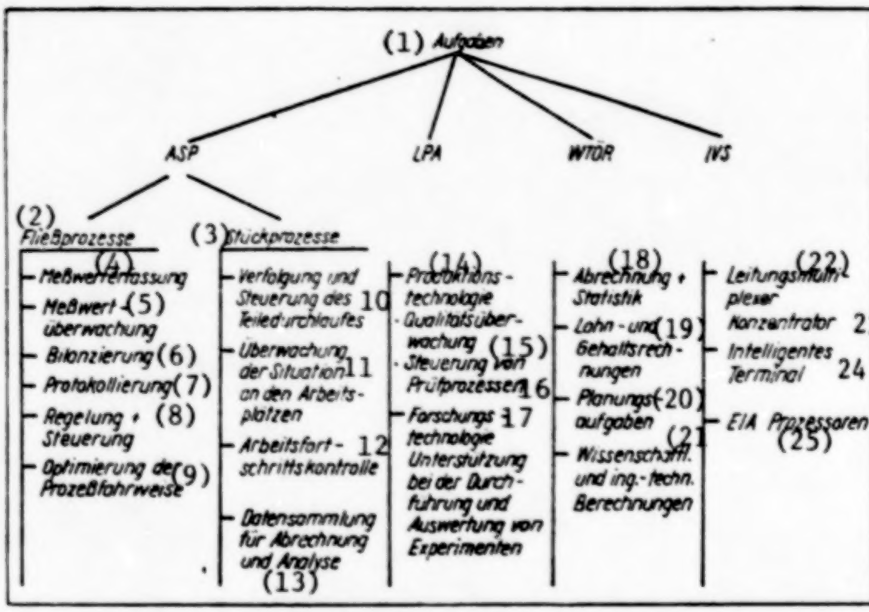

Figure 2: Problem complex per line of application

Key: 1. Tasks 2. Flow processes 3. Piece processes 4. Measured value acquisition 5. Measured value monitoring 6. Balancing 7. Recording 8. Control and regulation 9. Optimization of processes 10. Tracking and control of parts 11. Monitoring of the situation at the worker's areas 12. Check of work progress 13. Data collection for invoicing and analysis 14. Production technology 15. Quality control 16. Control of test processes 17. Research technology support in implementation and evaluation of experiments 18. Invoicing and statistics 19. Calculation of wages and salary 20. Planning mission 21. Scientific and engineering technical calculation 22. Line multiplexer 23. Concentrator 24. Intelligent terminal 25. Input/output processors

Due to the high, but limited, reliability and due to the fact that the computer is very highly utilized by extensive tasks of measured value acquisition and processing in real time, the tasks of optimum process control--called second processing level--can only be performed in a few cases. An equally important cause for the relatively low number of implemented optimum process controls is the insufficient modeling basis in connection with control algorithms as a prerequisite for a control which optimizes the processes.

Creation of these prerequisites requires an extensive process data acquisition and evaluation in order to determine a model structure suitable for optimum control and to adapt it to real production processes. In this area the VEB Petrolchemische Combine Schwedt has performed pioneer work for the chemical industry. An extensive process computer hierarchy system has been completed in the combine. With this system, the hierarchy character is optimized in accordance with the individual production processes under consideration of the conditions of the entire production line. By optimization of production processes and incorporation into the objectives of all production lines, a considerable increase in additional results is obtained. The following examples shall illustrate this.

By optimization of the operation of entire production lines, an increased yield was obtained and this is equated to 100 percent. If the individual production processes are optimized individually, then the increased yield is only about 30 percent. This type of complex production controls presumes a clear mathematical description of the production processes, the interdependencies and definite objective functions for total production lines.

Each evaluation of target functions is, in the final analysis, a clear, unequivocal numerical calculation. The accuracy of the result naturally depends on the accuracy of the term used. To a large extent, the quantities input into the target function are measured directly or indirectly at the production process. Increases due to optimization of production operation often lie on the order of measurement accuracy. This is another restriction to extensive introduction of optimum process control. This state of affairs is written by the following procedure:

1. It is assumed that the measurement error is constant within a small working area. With this we arrive at a relative statement.

2. By additional assessment equations with process computers, there follows a support of the measurement field in its absolute position.

In spite of these assumptions and aids, an increase in accuracy in process measurement technology is an objective necessity.

A use estimation for process computers is generally very difficult and can only be guessed. First, we present several examples which can be considered to be useful effects in the utilization of process computers for automated production control.

A very important aspect for processing technology is increasing throughput. A second very important objective is increasing material yields.

In the VEB Potash Plant in Zielitz, 20,000 tons of raw salt per day are mined by the floatation process. As a result of an 0.4 percent increase in yield, an annual gain of 1 million marks is obtained. In the VEB Steel and Rolling Mill, Brandenburg, an annual gain of M690,000 results from an optimum bar separation so that a recovery period of 1.5 years results for total capital expenses.

Another utilization aspect lies in early detection of system interference. Another aspect is that fault origin research is possible due to extensive information for acquisition in order to recognize basic fault sources in a technological process and to eliminate them specifically.

A reduction in expenses for conventional technology is also of fundamental significance. A mixed fodder plant in Ebeleben would require a larger building for conventional controls, because the scope of conventional technology requires a very large switching and equipment room and this would result in a high expenditure in routine maintenance.

In the VEB Robotron Elektronik, Riesa, more than 1,000 different electronic plug-in units are produced. Production controls, execution and testing of the plug-in units, including fault localization, are all computer supported. Every movement of goods in a storehouse takes place under control of the computer. With a complex "system for production control" we are able to introduce daily corrections in the production program, relative to the models produced, in a few hours with an appropriate material balance in production. Each production contract is secured by procurement of materials; material assignment takes place with respect to the workplace.

Another aspect is relief of the plant manager from routine work. Without the computer, the plant manager is required to check all readings and monitoring equipment and to record these at certain times in a log book. He is the sole monitor of the system. If the computer is available, the plant manager will increasingly use the computer for these purposes and implement system diagnosis in communication with the computer.

One important asepct is extensive information acquisition and processing for a technological procedure. Thus, for the first time it will be possible to work out a process model or to draw valuable conclusions for improving technological processes in a number of applications. The same is true for further development of apparatus in the production plant.

In many cases of process computer use, a savings in labor is also possible.

In summary, it is estimated that the amortization time for process computers is 1 to 3 years in automated production control, whereby one or the other of the discussed use aspects will be important for amortization.

Process computers used in the GDR are distributed among the individual industrial spheres as follows:

Manufacturing industry: 36 percent

Process technology: 28 percent

Metallurgy: 5 percent

Energy generation: 12 percent

Mining: 3 percent

Transportation: 7 percent

trade: 3 percent

Other: 7 percent

3. System Reliability

For an automation system the reliability is an important property and this is particularly true for computers.

If we talk about system reliability, two things are important:

1. What average fault intervals must be expected? This time is called MTBF (Mean Time Between Failures).

2. If a unit fails, how long will it take to repair it again? This time is a called the down-time T_A.

From this we have:

$$V_D = \frac{MTBF}{MTBF + T_A} \qquad (1)$$

V_D is the long-term availability, T_A the average downtime, MTBF the average time between two failures, $MTBF_i = MTBF_{PH} \cdot R_i$; $0.5 < R_i \leq 1$; $MTBF_i$ applies to the i-th unit and is defined by the guarantee documents; $MTBF_{iPH}$ is the value defined in the duty manual for the i-th unit.

The user expects that each piece of equipment will maintain a certain fault interval and that occurring faults can be repaired in a short time. A connection of these two quality parameters is expressed by the long-term availability (see equation 1).

The foregoing pertains to individual equipment. Data processing still cannot be performed by individual equipment; for this a functioning system of equipment is needed.

For the purpose of evaluating system reliability, the system MTBF is formed according to equation (2). From this it is quite clear that the system MTBF can only be smaller than that of the worst piece of equipment.

MTBF for system

$$\frac{1}{MTBF_s} = \sum_{i}^{n} \frac{1}{MTBF_i}; \qquad (2)$$

for simple redundance of the equipment we have:

$$MTBF_{red} = \frac{MTBF_i}{2}\left(3 + \frac{MTBF_i}{T_A}\right). \qquad (3)$$

For process computer systems at present, system reliability is clearly limited by the ESER disc memory technique. In order to compensate for such weak points in the system, it is possible to increase reliability by parallel-circuiting two pieces of the same equipment. The MTBF of the parallel circuiting is then calculated according to equation (3).

This type of redundance formation requires that the system control program assures that both disc memory lanes are addressed and supplied like a hot redundant.

Of the methods of calculation, we mention again that we are dealing with a statistic statment. Evaluation of the importance of each system component must be undertaken by the project engineer. The method of calculation treats all system components equally. Failure of one measurement channel within the process input/output system is evaluated as a system failure. In practice, this is not true and can be better modeled by project and program design for important system measurement channels by redundant systems. This is the task of the project manager. The different possibilities cannot be discussed within the framework of this report.

3.1 SPS ESPO 4000 Disc Memory System

The disc memory system (WPS) is the least reliable part of the computer system. To increase reliability a second input/output lane GSS/WPS was created for the system residence. This is supported by generated program steps PSS (plate memory system) on the ESPO 4000. Thus, all data (including internal system information) are stored on the memory plate formed by the two lanes. If the system residence fails (system plate lane), switching to the safety plate as system residence takes place automatically without loss of data. Besides eliminating the malfunction, the original system plate operates as a safety plate which is activated by the program system in accordance with the status of the last system plate. (This safety system is in practical employment in about 10 cases.)

3.2 ESFO 4000 Master-Slave-System (M-S-System)

For partically high reliability requirements, a MS system with fixed head disc memory was created for the PRS 4000 as a system residence.

A second computer (mass computer) is integrated into the system; this takes over process control tasks if the first computer (slave) fails. In normal operation, the master computer takes over superior tasks and monitors operation of the slave computer, whose task is to solve the actual process control problems.

Program support of the master-slave computer system consists in circuiting the slave on the master computer if the slave fails, as quickly as possible and without implementing any interruption in slave task processing. Here, further work should proceed with the previous "life" of the slave computer. A further increase in reliability of the MS system is achieved by increasing reliability of the slave system, by connecting the system plate with the control channel. This safety system operates similar to the ESPO 4000 and is integrated into the MS system.

Monitoring of the slave computer by the master computer is performed via direct computer coupling on the basis of a detailed fault recognition algorithm.

After elimination of a fault on an original slave computer, this computer will take over operation of the master computer system (used in the State Main Load Distribution Network for Energy and Gas.)

4. Development Trends in Process Computer Technology

Development of process computer technology is also determined by the developments in microelectronics. The last 8 years and prospects for the next 2 years indicate that about every 3 to 5 years, switching circuits with a performance increase of 4 to 10 times with simultaneous cost reduction by one-third and significant increase in degree of integration will be prepared by development of new basic technology. The change in generation of computers takes place with lower frequency, i.e. for example when a family of switching circuits is introduced into a product, this product will be produced over a longer time than the family of circuits replaced by the new developments. The change in generation of computers will take place more slowly.

4.1 Microcomputer Lines of the GDR

Microcomputer lines were already illustrated in Figure 1. The microcomputers, except for K 1600, have been described in several publications and can be considered to be well-known. The microcomputer family K 1600 is to replace the computer family Robotron R 4000 and will be produced in three models:

K 1610 component computer for OEM use (original equipment management)

K 1620 computer system, core capacity 28 K Words 16 bit

K 1630 computer system with high-performance arithmetic processor, core capacity 124 K words, 16 bit.

Computer systems of the K 1600 family will be used primarily at superior levels due to their performance and potentials for expansion.

The equipment basis of coming years will extend from the microprocessors to microcomputer assemblies, down to high-performance computer systems for automation systems. The following stages are seen (Figure 3):

--use of microcomputers for control and regulation (in the immediate vicinity of the process)

--installations for analog and digital measured values input/output while using microcomputer assemblies (PPR4 level)

--small process computer system (KPR3 level) in the sense of information compacting and control of several PPR

--process computer to control entire production lines; primarily use of the K 1630 (second level.)

A condition for effective utilization of the high performance of microcomputer technology is the availability of integrated A/D and D/A converters.

One application prognosis for microprocessors is illustrated in Figure 4.

According to present concepts, in the GDR more than 50 percent of microprocessors will be used in electronic EDP technology by 1985.

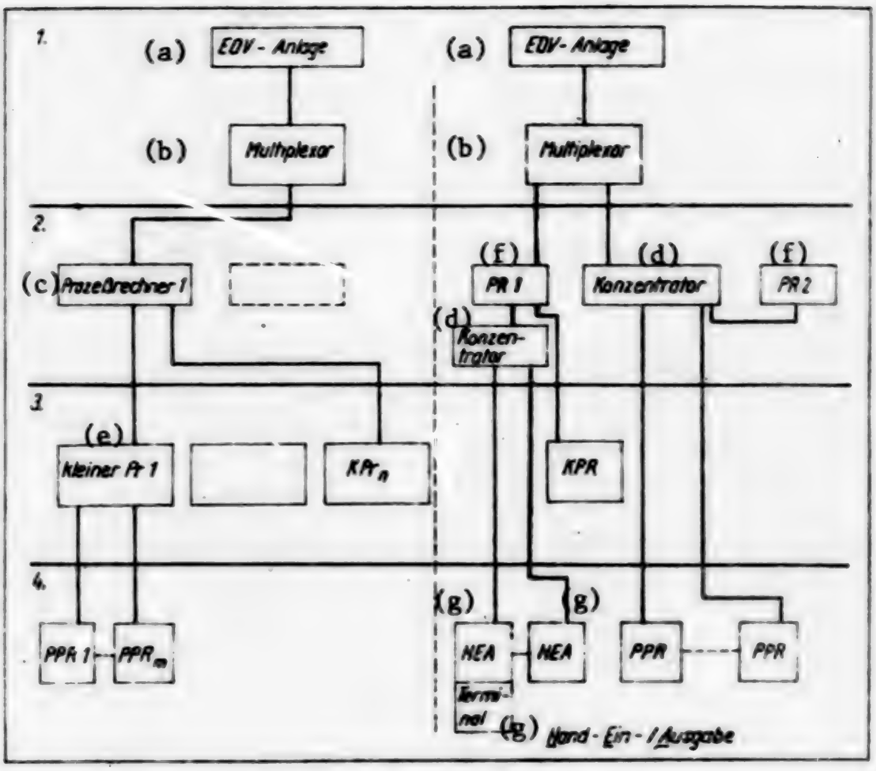

Figure 3. Computer hierarchy

Key:

a. EDP system b. Multiplexer c. Process computer d. Concentrator
e. Small process computer f. Process computer g. Manual input/output

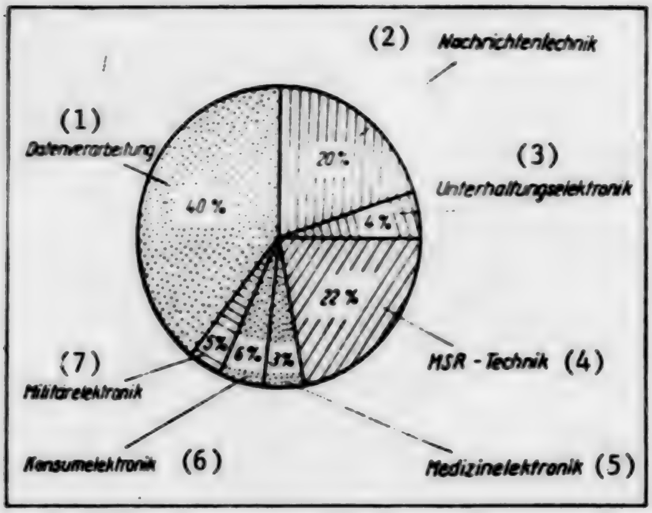

Figure 4. Estimation of Applications for Microprocessor Systems (1980)

Key:

1. Data processing 2. Information technology 3. Communications electronics
4. Master-slave computer 5. Medical electronics 6. Consumer electronics
7. Military electronics

4.2 Broad Application of Microelectronics Changes the Scope of Work for Project Engineers

The use of microcomputers in final production poses several problems which must be solved by a new technology, and which requires several basic changes compared to previous methods of operation. Such problems are:

--Determination of functions so that the algorithm problem concept can be established for the microcomputer in the result, down to changed operating technology. The scope of application is unlimited within the framework of memory volume. In the results of the most different price/performance studies, maximum utilization of flexibility, consideration of future expansions of the problem, the total algorithm must be fixed and this is the basis for the computer configuration. In establishing computer design it must be considered that the working memory in RAM suffers information losses for failure in the power supply. Under consideration of this situation of total problems solving, it must then be determined which programs shall be prepared in RAM, ROM, PROM or EPROM.

The functional concept of the total equipment and the program project should be considered to be a unit and should be performed by mutual cooperation. In the development of new equipment with microcomputers there is a new problem concept that the microcomputer in itself represents a relatively independent component and does not always have to be developed in chronological synchronization with the final product. Here, there are special forms of cooperation needed between final product and computer developer.

--Physical integration

Posing the Problem:

--geometric dimensions

--type and dimensions of the plug connections

--type and placement mode of internal cables

--ventilation diagram

--computer operation and other control operation functions

All these problems have effects on the design of the equipment.

The design of equipment must be oriented toward use of preferred measures, adherence to fixed level procedure and possibly the attachment of adapter equipment.

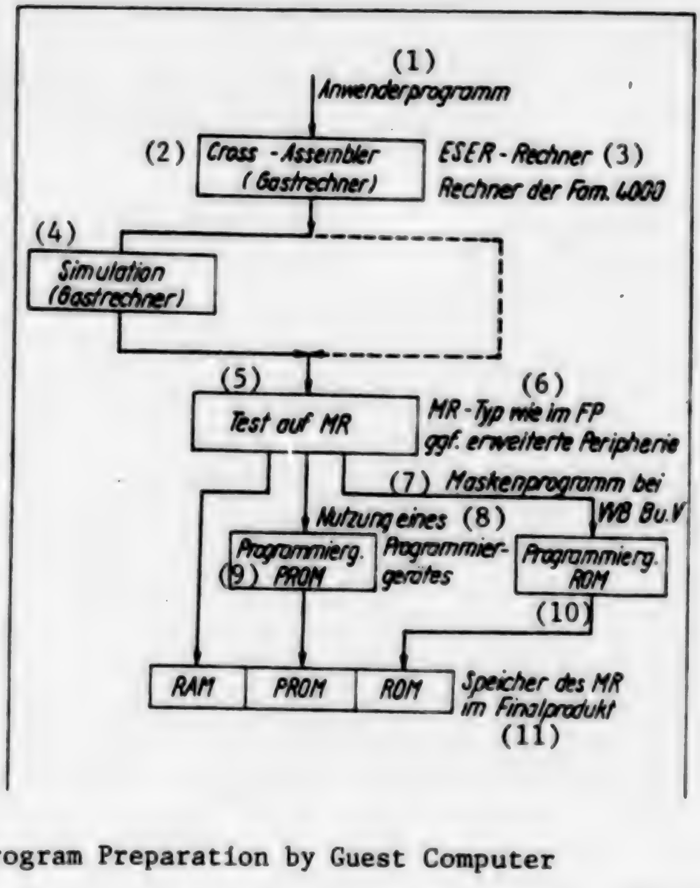

Figure 5. Program Preparation by Guest Computer

Key: 1. User program 2. Cross assembler (guest computer) 3. ESER computer, 4000 series computer 4. Simulation (guest computer) 5. Test on MR 6. MR type like FP. Possibly expanded periphery 7. Mass program for VVB B and V 8. Use of program equipment 9. Programmable PROM 10. Programmable ROM 11. Storage of the MR in the final product

--Service and Customer Service

The "microcomputer" component should be incorporated into customer service on the final product and requires appropriate qualifications and technologies in the organization of customer service. Handling of test programs represents different working methods.

--programing and testing of user programs

Program development for microcomputers, particularly when used in OEM, represents a special case. It is characterized by the fact that program development takes place on high-performance systems. The VEB Robotron Combine makes available large assemblers which permit development of programs on high-performance systems, e.g. ESER computer or 4000 series computer (Figure 5).

Another technology of program development and testing is the utilization of micro-computer development systems. The use of microcomputer development systems for acquisition, processing and translation of microcomputer programs exhibits several advantages:

--program development on the development system takes place in dialog operation

--the development system is in direct access to the program

--with the development system, we are able to generate a physical connection between the actual OEM microcomputer and thus a real time test is possible.

For high-performance microcomputer systems (K 1600) even modular operating systems are available which fill their system residence on disc memories.

On the basis of increased performance by microcomputers, problem oriented languages with dialog operation are now being used increasingly.

9280
CSO: 2302

DIRECTOR OF NUCLEAR RESEARCH INSTITUTE ON PROS, CONS OF ENERGY SOURCES

Budapest NEPSZABADSAG in Hungarian 17 Nov 79 p 3

[Article by Denes Berenyi, corresponding member of the Hungarian Academy of Sciences, Director of the Nuclear Research Institute, entitiled "Energy Sources Today and Tomorrow]

[Text] The energy sources and production of energy represent one of the central questions of modern society. One of the most important among them is the question of electrical energy. Without it, not only would our streets and homes be left in the dark, but our whole industrial production would be stopped.

Since the oil crisis, these questions were pushed into the foreground, repeatedly generating passionate discussions, demonstrations and even referendums and shaking parties and governments.

The demonstrations and protests were addressed in particular against nuclear power plants.

People nurture all kinds of concerns about the construction of nuclear power plants. Among these concerns, the problems of the protection and pollution of the environment stay in the center of the interest of public opinion everywhere in the world. It cannot be denied that there is a certain amount of real danger. However, we should not let unfounded hysteria to interfere with or to slow down the widespread application of energy generation by nuclear means.

Unfortunately, the conservatism and the attachment to the custom of a large portion of the population of every age group and, of course, the sad experience with the atomic bomb affect the people greatlv and play to the hand of the obvious materialistic interests of various capitalist concerns.

Thus, when we talk about dangers and risk, we should not restrict ourselves to the consideration of those due to the use of nuclear energy, but also should consider the risks to which we become exposed when we obtain

our energy from fossil carriers, such as coal, oil or natural gas. In this way, we will obtain a different and much more realistic picture than if we center our attention in an isolated manner on only one or the other of these sources.

What does endanger the environment?

First of all when coal is burnt, relatively large amounts of toxic materials pollute the environment: mercury, phosphorus, arsenic cadmuim, sulfurous products and others; in additon, alsc ashes and smoke, the "raw materials" of smog. It is perhaps more important because it goes to the very nature of coal firing, that carbon dioxide (and also, the toxic carbon monoxide), and what is the most shocking, the burning of coal releases more uranium and other radioactive materials into the atmosphere than nuclear power plants.

In order to visualise this, let us consider the electric power-generating capacity of our country, which amounts to about 5000 MW. If this would be covered entirely by coal, we would have to burn 25 million tons of coal every year. Now then, if we assume that the coal contains about the same amount of uranium as the earth's crust in general (4 grams per ton), the above mentioned amount of coal contains about 100 tons of uranium. Part of this reaches the atmosphere and the rest reaches our environment. Still, we did not take into account the thorium and other radioactive materials which are also present, and neglected the fact pointed out by Academician Sandor Szalay, the founding director of the Nuclear Research Institute of the Hungarian Academy of Sciences, that some of the Hungarian coal types (Mecsek, Ajka, Padrag), contain uranium in amounts which exceed the average concentration of 4 grams per ton by a factor of 10 to 20. This explains the Soviet estimation, according to which the waste effluent of a coal-fired power plant causes 500 times higher radioactive dose in the environment than a similar nuclear power plant.

As to petroleum, we should take not only the production of carbon dioxide, carbon monoxide, the sulfurous gases and other pollutants into consideration, but should point out the deleterious effects of the many hundred thousand tons of oil released into the ocean from the tankers, the destructive fires which occur quite often in the tank farms (and the resultant pollution of the atmosphere) and should believe the unbelievable: the petroleum supplies of the Earth are dangerously close to being exhausted. Together with the other above-mentioned facts, this applies also for natural gas.

On the other hand, in view of the principle of their operation, the nuclear power plants do not need any oxygen and therefore they do not release any carbon and sulfur oxides into the atmosphere. They release

only relatively negligible amounts of radioactivity; under normal operating conditions, the released radioactivity amounts to 1/10,000 of the natural radioactive background. This is still true if we take the eventual reactor accidents into account.

Erroneous fear.

During the recent past, great panic was created in the United States by the Harrisburg reactor accident, which according to the news, is considered as "the largest accident in a nuclear power plant". Now then, in this "largest accident", the radiation dose to the population did not reach one-third of the dose that one experiences in the case of medical chest x-ray. There are many nuclear power plants in operation throughout the world (in Europe alone there are 120, with a total production capacity of more than 100,000 MW. Compare this with the above-mentioned 5000 MW of total domestic electric energy producing capacity).

Thus, if we state that the utilization of the currently available type of nuclear energy, fission energy, involves without any doubt, certain risks, we must immediately add that this type of energy is the least dangerous one for mankind (of course, right now we can consider only the actually available energy sources: fusion energy is only the promise of the future; from this point of view, and the hydroelectric, solar and other energies do not appear to be sufficient to solve the energy problems). This was the conclusion, as an example, last year of the Scientific Council of the American Medical Association, stating that the fossil energy carriers present much more risks for the health than the nuclear fuels. It should be also pointed out that according to the Soviet experience, apart from considerations of the health and environmental protection, the cost of generating electrical energy is about 25 - 50% lower in nuclear power plants than in plants operated with fossil fuels.

Finally, an important statement should be made. The fear of atomic energy is due to the erroneous theory that radioactive radiation, as such, is dangerous and injurious. However, the truth is that this radiation is a natural one. Mankind was always exposed to it, since it lives on Earth. Moreover, there are today regions of the Earth (e.g. in India, Brazil and in our country, in Eger)where the radiation is much higher than elsewhere (in the Kerala state in India, it is five times higher). In spite of this, the most careful examination is unable to detect any deleterious effect resulting from it. The danger arises only when the radiation dose is large.

The real concern: the waste

Relatively most of the concern is caused by the radioactive waste from nuclear power plants. At present, they are stored in stainless steel

containers which are continuously checked and thus do not present a direct risk. However, in view of the fact that their decay (their becoming radiation-free) takes hundreds, and in case of some cases, thousands of years, their continuous control presents a major problem.

Experiments are in progress to solve the problem of the storage of liquid radioactive waste. It has been proposed to incorporate them into various rocks, such as rock salt, which in the logical scale are stable formations. According to another scheme, the long half-life wastes would be transformed into shorter half-life products by methods of nuclear physics. Tests are made in pilot plants to incorporate the waste materials in question into highly resistant glass blocks.

It is well known that our country does not possess sufficient amounts of fossil energy carriers, and therefore the utilization of nuclear energy in our country is very important. In addition, it is not news that the installation of the 1st 440 MW reactor units purchased from the Soviet Union is well advanced; this will be followed by other units.

On the other hand, it is much less known how much preparatory work is in progress, specifically to protect the environment.

There is a special R/D project within one of the programs of the Ministry of Heavy Industry to investigate protection of the environment in connection with atomic power plants. This involves not only the development of instrumentation and methods for the measurement of the radioactivity of the air, the water and the soil, but the determination of the present status is considered also as an important task, because later on these data will be used as a reference to determine even the smallest deviation from the norm. More than ten institutes participate in this important and significant work.

Agreement of the Council for Mutual Economic Assistance.

We are not involved in research on reactor physics at the Nuclear Research Institute of the Hungarian Academy of Sciences at Debrecen, but for more than a quarter of a century we have been carrying out successful studies on subjects related to research on the nuclear environment and environmental protection. For example, on the initiative of Academician Sandor Szalay, the measurement of radioactivity of rain-water was started in 1952. This study yielded valuable data for the fight toward the conclusion of an international agreement concerning the prohibition of atomic bomb tests.

The tracking of the radioactive krypton-85 content of the atmosphere is very important also from the viewpoint of peaceful applications. Our institute acts as the coordinator in this subject field within the Council for Mutual Economic Assistance.

In cooperation with the Central Research Institute for Physics and with other institutes, the Nuclear Research Institute participates in the scientific studies related to the Paks nuclear power plant, in particular, in the development of personnel dosimetry within the plant.

It is becoming increasingly obvious nowadays that the nuclear environmental protection exerts a good influence onto environmental protection in general. The developed methods and requirements, the norms and the standards of detrimental effects compel other branches of industry and help to fight against other pollutants.

The whole energy problem must be considered in the proper context and in perspective. Several new energy sources are being intensively investigated at present: fusion (thermonuclear) energy, solar energy, geothermal energy, etc. Without any doubt, at present the first one appears to be the most promising, but the others should not be neglected. At the same time, we should not forget that the conceptually already completed power plants (based on coal, oil or nuclear fuel) which are now in the planning and construction stage, will provide our electricity during the coming decades. However, it is clear that in the following decades, our energy supply will be covered jointly by coal, oil, atomic energy, and to a smaller extent by other energy sources. We should not be afraid of any of them, if during their application and in particular, during the planning, we do not forget to consider the environmental protection aspects, and the research, development and application of the required technology.

CSO: 2502

2210

COMMUNICATION RESEARCH AT TECHNICAL UNIVERSITY HIGHLIGHTED

Budapest NEPSZABADSAG in Hungarian 17 Nov 79 p 6

[Article by Gabor Pal Peto: "Industrial Problems--Within Hearing Distance"]

[Text] The Budapest Technical University's Communication Technology Electronics Institute

Electronics is one of the fastest, almost frantically growing science of our era. Every hour of the day one encounters its practical applications: the radio, television, telecommunication, computers and the extreme multitude of the ways all these electronics are used.

The electronics industry is also an important factor in our country's national economy. The 4,000 jobs requiring diplomas in this and in the connecting industrial branches are filled by professionals from the Budapest Technical University's electrical engineering department, and through the Communication Technology Electronics Institute. Of the 400 electrical engineers graduating every year, a hundred earn their diplomas by solving problems presented by this institute. About a dozen and a half degreed engineers also work in this institute, who already have jobs somewhere else and are getting ready to earn their second diplomas by their research work here, or who perhaps aspire for a technical PhD or candidate grade.

It is apparent even from this sketchy picture about which Sandor Csibi, the institute's director gave us information, that in this educational unit of the technical university, education and research are practically inseparable from each other, even though about 60 of its 100 workers primarily teach. However, together with the 10 researchers who do only this and with the additional 35 workers with various backgrounds, they also do a fair share of this work. Obviously only a taste of such multifaceted work can be given in a newspaper article, since the institute's workers publish an average of 30 papers of professional literature a year and often write in domestic and foreign technical magazines--not to mention their books, invention reports, descriptions of their constructions; their work is reflected in all these.

Quality Control From the Distance

Let us begin with what is the closest to everyone: listening to the radio. We know that besides "program three" today the other programs are also being transmitted on the ultrashort wavelength (URH) [UHF], and the television is UHF transmission also. One of the Post Office's--which operates the transmitters--constant task is to control the quality of the UHF transmitter stations, thus for example that interfering signals should not get into the transmission, that it should transmit the entire sound range, that there should be no bleeding over between two channels in stereo transmission. There are quite a few such transmitters in Hungary (Budapest, Pecs, Nagykanizsa, Kabhegy, Szentes and others). It is an advantage if the quality of the transmissions can be controlled from one central location: at the present time such control of just one transmitter is 6 hours of work for several people, which can be done only during nontransmission hours.

Jozsef Komarik and Laszlo Palotas with six fellow workers on assignment by the Post Office have developed the automated system by which the modulation line between the studio and the transmitters, as well as the transmitters themselves can be controlled from one single center--and all this in 5 minutes! In addition, the equipment also records the measured data. "Developing the system" sounds simple, but there are 4 years of work behind it. The result represents not only a theoretical solution but also equipment and measuring instruments which have been turned over to the Post Office for their use. To be able to do all this, so many new theoretical questions had to be solved, and so many new technical solutions found--among them several on inventions. Three people also obtained technical PHd or candidate degrees as a result of these.

But interesting technical problems are offered not only by the television and radio transmission and receptions, but also by the telephone. They also familiarized me with a few of their results achieved in transmission technology. The main condition of improving telephone transmission is to be able to measure its quality in a modern way. Now, if for example they wanted to check on voice quality of some equipment which carries 300 lines, it would be necessary to speak on all 300 lines at the same time. This cannot be done with people, therefore a speech-imitating generator has been developed which "substitutes" the individual speakers more faithfully than in the past. Another instrument measures faster and more accurately than before, the functional range of the transmission equipment, or, how "strong" can the signals be. By this the transmission equipment can be improved with their mass production and expensive foreign measuring instruments will not be needed.

"In 1969 for a few months I had the privilege of working together with Nobel prize winner Denes Gabor, said Geza Gordos, and he said about the very important problem of speech recognition: "If many people work on it industriously, it can be solved by the middle of the next century." We endeavor to at least prove our industriousness in some part areas, such as the recognition of the so-called stop consonants (for example "k"),

In a joint experiment with a physician we are successfully applying one of our methods to determine about twin children whether they are monoovular or biovular, based on acoustical investigations.

Man-Machine Conversation From Anywhere

Experts in this country are doing a lot of work to solve such questions as to how to make computerized remote processing through the telephone lines, for as broad a circle of users as possible. And this is not some kind of distant future question, but a pressing current need.

Two young researchers, Gyorgy Dallos and Csaba Szabo are working on the solution also which is related to tele-processing of data. And their efforts are not without success, which is proven also by the facts that the dissertation of one of them was published by the University of Hawaii, one of the pioneers of this specialized area--where on a scholarship he worked on this problem--and [the dissertation] of the other can be read in the monograph prepared based on the lectures delivered at the Pushchino (Soviet Union) international conference. They form the link between the work stations connected to the computers, the so-called terminals (equipment consisting of a display screen and of a keyboard) and the computer by means of radio waves.

Connection between the terminal and the computer can also be established by wires. Many computer services work this way, but construction of such transmission channels is awkward. The computer can be reached only from predetermined points. They are trying to enable here everyone to send their questions to the computer from terminals located anywhere, scattered all over, or even from portable ones, and do so on the same wavelength, so that when a line of the text has been completed, it will "shoot" the message package into the air on this wavelength, equipped with the terminal's address. Then when the computer broadcasts its results (but each one coded) it is addressed [coded] so that only the addressee can receive it. Of course if two messages coming from two places collide, and if the computer cannot receive one of them, the terminal must be signaled so that it can repeat the transmission. This happens so fast that the person working at the terminal in a conversational mode of operation does not even notice that his transmitter has repeated, and that the reply from the center arrived later. These delays cannot be perceived: they are just a second or two.

"We are now setting up this system next to the IMB 370/115 center in the institute," Professor Csibi added. "Thus, for example, during the practical sessions of a group of students direct contact with the computer center can be established."

EKG and Computer

Mathematician Laszlo Gyorfi reported on another important development of computer technology services. Considering the "prominent" position

circulatory system illnesses occupy among causes of death, a rapid, mass and at the same time inexpensive EKG examination similar to the screening tests to detect TB would be practical. Work is currently being done at the institute in cooperation with a group of cardiologists of the Sandor Koranyi National TB and Pulmonology Institute and of the Godollo Lung Screening Station to develop an inexpensive computerized evaluation method which would of course "prescreen" only for the physician. By this they are trying to evaluate the EKG curves taken in 10 seconds from the patient after the TB check, relying on microcomputerized equipment placed in the field. There is already equipment in mass-experimental use in Godollo which records and "preprocesses" the EKG data, then stores it on a casette until processing at the institute. The researchers are hopeful. They have found good associates in the physicians.

They always do work connected to the practical life, and at the same time also always dig deep to solve fundamental questions in this university workshop of electronics research. The results prove this approach. The students who graduate from there carry with themselves the example of their teachers into industry which prompts them towards the necessity of passionately searching for new solutions.

8584
CSO: 2502

NATIONAL COMPUTER SITUATION DESCRIBED

Warsaw WIADOMOSCI STATYSTYCZNE in Polish No 9, Sep 79 pp 29-32

[Article by Dr Jan Iszkowsky, Research and Development Center, National Statistical Information System, GUS [Main Statistical Administration]: "Data Processing Centers in 1978"]

[Text] General Characteristics of the Centers

At the end of 1978 the country had 1,805 data processing centers;[1] the net increase was 149, or 9 percent. Let us recall that these are units, regardless of their organizational or financing form, which engage in one of the following types of activity:

- --computer and punched-card machine design and programming;
- --data processing with computers or punched-card machines;
- --creation of data media;
- --computer and punched-card machine installation, maintenance and repair;
- --application of computers to control of production processes;
- --training of data processing personnel;
- --research and development work in computer science;
- --organizational consultation regarding applications of computers and punched-card machines;
- --coordination of work in computer science.

Some 56,176 workers (10 percent more than at the end of 1977) were employed in these centers.

We have, however, eliminated units which do not possess computers from our detailed analysis of the material if they did not employ at least four workers. There were 337 such "centers," but they employed only 681 workers. In the tables in this article other than Table 5, we shall accordingly present data regarding 1,468 centers for 1978 and data of comparable scope for previous year. (Table 1).

---

1. Excluding the defense and interior ministries.

The rate of increase in the number of data processing centers began to drop sharply in 1977, but there was a reversal of this trend in 1978. At the same time, a favorable change in the proportions of this growth was noted: today employment is increasing somewhat more rapidly than the number of centers. Thus the average size of the centers, which has in any case been small, is increasing, while in 1975-1976 the increase in the number of centers was considerably greater than the increase in personnel.

Table 1. Data Processing Centers and Personnel

In absolute terms

	1975	1976	1977	1978
Centers	1031	1252	1365	1468
Workers	40400	46200	50500	55500

Preceding year = 100

	1975	1976	1977	1978
Centers	306	121	109	108
Workers	114	114	109	110

An increase in the resources possessed by centers has also begun. For 100 centers there were:

92 computers in 1975;
124 computers in 1976;
138 computers in 1977;
143 computers in 1978.

The computer holdings situation in data processing centers is shown in Table 2.

Table 2. Computers in Data Processing Centers.

In absolute terms

	1975	1976	1977	1978
Total	944	1547	1890	2091
Small and medium size	514	623	708	756
Minicomputers	430	924	1182	1336

Preceding year = 100

	1975	1976	1977	1978
Total	...	164	122	111
Small and medium size	...	121	113	107
Minicomputers	...	215	128	113

This increasing trend in average center size does not mean a relative increase in the number of large centers, but stems primarily from a certain decrease in the number of the smallest centers (employing fewer than five workers) in favor of small centers (employing from 5 to 20 workers), as illustrated in the following table.

Table 3. Centers Grouped by Size.

1 Klasy wielkości ośrodka według liczby pracowników	W liczbach bezwzględnych 2			W odsetkach 3		
	1976	1977	1978	1976	1977	1978
4 Ogółem	1252	1365	1468	*100,0*	*100,0*	*100,0*
5 Poniżej 5	212	190	177	*16,9*	*13,9*	*12,1*
5—10	319	414	471	*25,5*	*30,3*	*32,1*
11—20	259	254	277	*20,7*	*18,6*	*18,9*
21—50	240	257	273	*19,2*	*18,9*	*18,6*
51—100	113	134	142	*9,0*	*9,8*	*9,7*
101—200	67	67	74	*5,3*	*4,9*	*5,0*
200—500	37	44	49	*3,0*	*3,2*	*3,3*
6 Powyżej 500	5	5	5	*0,4*	*0,4*	*0,3*

Key: 1. Size class in terms of number of workers
2. In absolute terms
3. Percentages
4. Total
5. Fewer than 5
6. Over 500

Data processing centers engage in the various activities mentioned above, with 604 centers providing a single type of service and the others providing diversified services.

In 1978 the number of centers engaged in training and in coordinating and consulting work in the development of data processing increased more than the average, while the numbers involved in systems design and programming, computer data processing, research and development work and other activities decreased (even in absolute terms). Excluding the natural decrease in the number of centers involved in punched-card equipment design and use, the other trends do not have an unambiguous interpretation, for a number of factors are active here (inadequate facilities, specialization and the like) [see Table 4].

In 1978 there were 52 centers that had no data processing machinery.

The majority of centers are engaged in activities exclusively for their own units, i.e. for the centers themselves or for their mother units. External services of the main types are as follows:

--computer data processing	412 centers
--production of data media	367 centers
--computer system design and programming	325 centers
--training of data processing personnel	76 centers
--installation, maintenance and repair of computers	25 centers.

Table 4. Data Processing Centers by Type of Activity.

	Rodzaje działalności	1977	1978	1977 = = 100
1	Rodzaje działalności	1977	1978	1977 = = 100
2	**Ośrodki ogółem**	**1365**	**1468**	***108***
3	Ośrodki działające w zakresie:			
4	projektowania i programowania systemów na komputery . . .	932	907	*97*
5	projektowania i programowania systemów na maszyny analityczne	68	58	*85*
6	przetwarzania danych na komputerach	811	809	*100*
7	przetwarzania danych na maszynach analitycznych	119	74	*62*
8	tworzenia nośników informacji	1114	1158	*104*
9	szkolenia kadr dla informacji . .	141	172	*122*
10	prowadzenia prac badawczo-rozwojowych	318	290	*91*
11	doradztwa organizacyjnego . . .	167	180	*108*
12	koordynacji prac w zakresie informacji	355	407	*115*
13	instalacji, konserwacji i remontu komputerów	.	249	.
14	stosowanie komputerów do sterowania procesami produkcyjnymi	.	56	.

Key: 1. Type of activity
2. Total centers
3. Centers working in area of:
4. Planning and programming computer systems
5. Planning and programming punched-card systems
6. Computer data processing
7. Punched-card data processing
8. Creation of data media
9. Training data processing personnel
10. Research and development
11. Organizational consulting
12. Coordination of work in data processing field
13. Computer installation, maintenance and repair
14. Employment of computers for control of production processes

There were 126 independent cost-accounting centers. In 1978 there were only a few slight changes in the territorial distribution of centers; we shall not attempt to discuss the trends in these changes, but will limit ourselves to providing the data for 1978. These data apply to the total number (1805) of centers and thus are comparable with the information given last year for the years 1975 and 1977.[2]

---

2. Cf. R. Gujski, "Data Processing Centers in 1977," WIADOMOSCI STATYSTYCZNE No 10, 1978, p. 34.

Table 5. Data Processing Centers, Workers and Computers by Voivodship, 1978.

	1 Województwa	Ośrodki 2	Pracownicy 3	Komputery 4
5	**Polska**[a]	1805	56176	2092
6	Stołeczne warszawskie	334	13602	668
7	Bialskopodlaskie	2	7	1
8	Białostockie	21	620	21
9	Bielskie	46	927	46
10	Bydgoskie	70	2120	39
11	Chełmskie	1	14	—
12	Ciechanowskie	2	67	4
13	Częstochowskie	19	592	14
14	Elbląskie	7	167	6
15	Gdańskie	80	2974	109
16	Gorzowskie	12	141	15
17	Jeleniogórskie	26	539	17
18	Kaliskie	23	369	25
19	Katowickie	221	7888	230
20	Kieleckie	23	1256	27
21	Konińskie	12	165	11
22	Koszalińskie	18	468	10
23	Miejskie krakowskie	112	3313	132
24	Krośnieńskie	11	207	8
25	Legnickie	23	272	8
26	Leszczyńskie	2	6	1
27	Lubelskie	34	1018	42
28	Łomżyńskie	2	8	2
29	Miejskie łódzkie	137	3735	127
30	Nowosądeckie	7	121	5
31	Olsztyńskie	30	1096	19
32	Opolskie	41	768	40
33	Ostrołęckie	5	49	1
34	Pilskie	8	119	6
35	Piotrkowskie	14	138	9
36	Płockie	12	318	17
37	Poznańskie	107	2861	86
38	Przemyskie	2	19	8
39	Radomskie	22	828	15
40	Rzeszowskie	16	846	24
41	Siedleckie	8	86	10
42	Sieradzkie	4	74	5
43	Skierniewickie	12	189	10
44	Słupskie	9	111	5
45	Suwalskie	2	24	1
46	Szczecińskie	54	1370	46
47	Tarnobrzeskie	11	379	17
48	Tarnowskie	13	316	15
49	Toruńskie	28	579	35
50	Wałbrzyskie	30	644	16
51	Włocławskie	11	163	6
52	Wrocławskie	89	3901	112
53	Zamojskie	3	29	—
54	Zielonogórskie	29	676	21

a Bez ośrodków MON i MSW.

Excluding defense and interior ministries

Key: 1. Voivodship
2. Centers
3. Workers
4. Computers
5. Poland [excluding defense and interior ministries]
6. Warsaw
7. Biala Podlaska
8. Bialystok
9. Bielsko Biala
10. Bydgoszcz
11. Chelm
12. Ciechanow
13. Czestochowa

[continued]

[continuation of key from preceding page]

14.	Elblag	35.	Piotrkow Trybunalski
15.	Gdansk	36.	Plock
16.	Gorzow Wielkopolski	37.	Poznan
17.	Jelenia Gora	38.	Przemysl
18.	Kalisz	39.	Radom
19.	Katowice	40.	Rzesow
20.	Kielce	41.	Siedlce
21.	Konin	42.	Sieradz
22.	Koszalin	43.	Skierniewice
23.	Krakow City	44.	Slupsk
24.	Krosno	45.	Suwalki
25.	Legnica	46.	Szczecin
26.	Leszno	47.	Tarnobrzeg
27.	Lublin	48.	Tarnow
28.	Lomza	49.	Torun
29.	Lodz City	50.	Walbrzych
30.	Nowy Sacz	51.	Wloclawek
31.	Olsztyn	52.	Wroclaw
32.	Opole	53.	Zamosc
33.	Ostroleka	54.	Zielona Gora
34.	Pila		

The total of 1,805 data processing centers are divided among the ministries as follows:

--Ministry of the Machine Engineering Industry	293
--Ministry of the Heavy and Agricultural Machine Industry	136
--Ministry of Science, Higher Education and Technology	118
--Ministry of the Chemical Industry	180
--Ministry of Light Industry	148
--Ministry of Construction and the Construction Materials Industry	148.

Each of the remaining ministries has fewer than 100 centers.

Breakdown of Resource Holdings

The total value of the hardware in data processing centers was 27.6 billion zlotys in 1978.

This was distributed as follows:

--computers	81.0 percent	
small and medium size		70.4 percent
minicomputers		10.6 percent

--equipment for preparing data media	13.5	percent
--equipment for teletransmission of data	2.6	
--punched-card equipment	2.1	
--other	0.8.	

While the total number of computers in data processing centers increased by 11 percent, the number of large and medium-size computers increased by 7 percent and that of minicomputers by 13 percent (cf. Table 2). This produced a further increase in the proportion of minicomputers in the total number of computers. The proportion was:

45.5 percent in 1975;
59.7 percent in 1976;
62.5 percent in 1977;
63.1 percent in 1978.

The most common types of large and medium-size computers included:

ODRA 1305	243
ODRA 1304	76
ODRA 1304 [as published]	63
ODRA 1204	58
R-32	38
R-20	2[illegible].

Among minicomputers the following types are predominant:

Mera 305	368
Mera 303	288
Mera 301 and 302	201
Mera 306	67
Mera 400	50.

In 1978 the largest increase in number of computers was for the R-32 (42%), and in minicomputers it was for the Mera 400 (127%) and the Mera 306 (59%). The proportion of domestically-produced computers was 74.6 percent, including 70.1 percent of large and medium-size computers and 77.2 percent of minicomputers. The proportion of third-generation large and medium-size computers was 74.7 percent (compared to 73.0 percent in 1977).

In addition to the above division of computers into large and medium-size on one hand and minicomputers on the other, in 1978 computers were also grouped according to internal storage capacity [see Table 6].

The largest computing potential is represented by computers in the middle 65-256 Kbyte class, while their number amounts to only 23.9 percent of the total number of computers.

Table 6. Computers Grouped by Size of Internal Memory, 1978.

	1 Ogółem	2 Według klas pojemności pamięci wewnętrznej w Kb			
		8—64	65—256	257–512	powyżej 512 3
4 Liczba komputerów	2092	1413	501	160	18
5 Struktura	*100,0*	*67,5*	*23,9*	*7,7*	*0,9*
6 Pojemność pamięci wewnętrznej . . .	177,5	25,6	66,1	57,9	27,9
7 Struktura	*100,0*	*14,4*	*37,2*	*32,6*	*15,8*

Key: 1. Total
2. By size of main memory (Kbyte)
3. Over 512
4. Number of computers
5. Breakdown
6. Amount of internal memory
7. Breakdown

In connection with the rapid decline in the numerical growth of computers which began in 1977, changes in the breakdown of computers by age occurred. Currently the 4-5 year age category is predominant.

Table 7. Breakdown of Computer Inventory by Age.

	Ogółem 1	2 Komputery w wieku lat					
		1—3	4—5	6—8	9—10	11—15	pow. 15 3
	4 w odsetkach						
1977	100,0	57,1	27,5	9,3	3,6	1,7	0,8
1978	100,0	35,1	43,5	16,2	3,1	1,8	0,3
5 Różnica w punktach	—	−22,0	+17,0	+6,9	−0,5	+0,1	−0,5

Key: 1. Total
2. Age, years
3. Over 15
4. Percentages
5. Difference, points

In 1978 the number of devices for preparation of machine data media increased sharply, particularly as a result of deliveries of magnetic tape units and bookkeeping and invoicing machines, among others [see Table 8].

Holdings of equipment for teletransmission of data increased by half in 1978 [see Table 9].

The number of different types of punched-card equipment decreased further in 1978 to 1266 pieces (8.4 percent), while the number of calculators decreased to 44 (by 41.7 percent).

Table 8. Data Media Preparation Equipment in Data Processing Centers.

		1977	1978	1977 = = 100
1	Ogółem	14339	16399	114,4
2	Rejestratory jednostanowiskowe	36	59	163,9
3	Rejestratory wielostanowiskowe	89	211	237,1
4	Dziurkarki kart	6487	6892	106,2
5	Sprawdzarki kart	4098	3882	94,7
6	Dziurkarki — sprawdzarki kart	98	64	65,3
7	Dziurkarki, sprawdzarki i dziurkarki — sprawdzarki taśm	506	552	109,1
8 9	Maszyny księgujące, fakturujące, automaty obrachunkowe i organizacyjne	1891	3395	179,5
10	Automaty piszące, dalekopisy, flexowritery	877	964	109,9
11	Perfonumeratory	205	308	150,2

Key: 1. Total
2. Single-position data entry units
3. Multiposition data entry units
4. Card punch units
5. Card verifiers
6. Card punch-verifiers
7. Tape punches, verifiers and punch-verifiers
8. Bookkeeping and invoicing machines
9. Automatic accounting and organization machines
10. Automatic printers, teleprinters and flexwriters
11. Perforated numbering machines

Table 9. Data Transmission Equipment in Data Processing Centers

		1977	1978	1977 = = 100
1	Ogółem	1605	2413	150
2	Końcówki inteligentne	33	44	133
3	Końcówki nieinteligentne	840	1161	137
	w tym dialogowe	495	905	183
4	Urządzenia sterujące transmisją danych	121	225	186
5	Konwertory sygnałów binarnych	611	983	151

Key: 1. Total
2. Intelligent terminals
3. Nonintelligent terminals, including interactive terminals
4. Data transmission control units
5. Binary signal converters

Utilization of Computer Running Time

The average time of utilization of large and medium-size computers per working day was at essentially the same level in 1978 as in 1977, i.e. 13.1 hours, while the utilization time for minicomputers increased by about 8 percent to 6.5 hours

per working day. The smallest percentage of utilization of nominal working time (computed with reference to the workshift rate at the centers) was considerably larger (89.4 percent) for large and medium-size computers than for minicomputers (70.6 percent).

As regards imported computers, their working time per day was greater (14.9 hours for large and medium-size computers and 8.9 percent for minicomputers [as published], resulting primarily from the larger workshift rate.

In the breakdown of work and nonwork time, changes which were favorable overall occurred, involving an increase of 6.4 points in the percentage of work time and a corresponding decrease in the percentage of down time. Technical and organizational causes were represented to an equal degree in the quantity of down time. The working time of computers was used as follows (by type of processing):

Table 10. Breakdown of Computer Working Time by Type of Processing.

	Tematyka opracowań 1	1977	1978
		w odsetkach 2	
3	Ogółem	100,0	100,0
4	Sterowanie procesami produkcyjnymi	16,4	17,0
5	Prace projektowe, obliczenia inżynierskie i naukowe	16,5	19,4
6	Zarządzanie	67,1	63,6
7	w tym w systemach:		
8	wielodziedzinowych	3,2	2,8
9	technicznego przygotowania produkcji, planowania i kontroli wykonania planów produkcji	9,5	8,7
10	gospodarki materiałowej	14,7	12,9
11	gospodarki towarowej	4,7	5,2
12	gospodarki środkami trwałymi	2,3	1,8
13	rozliczenia finansowe	10,3	13,0
14	gospodarki kadrowej	6,2	5,1
15	statystyki i analizy statystycznej	8,6	7,0

Key: 1. Type of processing
2. Percentage
3. Total
4. Control of production processes
5. Design work, engineering and scientific calculations
6. Management
7. Including the following systems:
8. Multiarea
9. Technical preparation for production, planning and monitoring of production plan performance
10. Materials management
11. Commodity management
12. Management of fixed assets
13. Financial accounting
14. Personnel management
15. Statistics and statistical analysis

A positive phenomenon is the increased use of computers for the control of industrial processes and in finance applications.

The Personnel Situation in Data Processing Centers

The number of workers in data processing centers has increased by 10 percent (cf. Table 1), while the number of computers has increased by 11 percent (cf. Table 2), which is explained both by the stability of computer work time (particularly for large and medium-size computers) per day (as a result of the impossibility of running a larger number of shifts) and by the relatively small changes in the employment breakdown.

In 1978 the structure was as follows (percentages of total employees):

--systems analysts and designers	12.1	
--programmers	12.8	
--operators	31.6	
computer operators		8.7
--system operators	3.0	
--maintenance personnel	9.5	
--input-output controllers	7.0	
--other workers in basic activities	13.8	
--administrative and office workers	6.2	
--other workers in auxiliary areas	4.0	

The percentage of workers with higher education was 29.5 percent (an increase over the figure of 28.8 percent in 1977), while it was 90.8 percent for system analysts and designers and 58.7 percent for programmers.

The lower employment growth rate in comparison with 1975-1976 also affected labor turnover indicators. They were as follows:

Table 11. Labor Turnover in Data Processing Centers

1 Grupy pracowników	2 Współczynnik 3 przyjęć			4 zwolnień		
	1975	1977	1978	1975	1977	1978
5 Ogółem	30,7	22,9	20,0	19,4	16,4	15,8
6 w tym:						
7 Analitycy i projektanci systemów	26,9	17,0	11,7	17,5	13,4	10,9
8 Programiści	33,0	24,0	18,8	18,1	16,4	14,6
9 Operatorzy	35,4	27,2	25,9	21,3	19,4	20,0
10 Konserwatorzy	32,8	22,7	18,4	16,7	14,2	14,3

Key: 1. Group of workers
2. Coefficient
3. Hirings
4. Terminations
5. Total
6. Includes:
7. System analysts and designers
8. Programmers
9. Operators
10. Maintenance personnel

The labor turnover indicators for operators continue to be high, and moreover they showed no improvement in 1978. One cause may be the wage situation, since operator wages had the smallest increase in 1978 (2.2 percent) and today average 3,383 zlotys. The average wage of a data processing center worker also rose only slightly (by 2.5 percent), amounting to 4,527 zlotys in 1979. Higher salaries are earned by the following: system analysts and designers (6,262 zlotys), administrative and office workers (5,083 zlotys), maintenance personnel (5,004 zlotys) and--to a slight degree--programmers (4,577 zlotys).

Work Value and Costs of Labor and Services in Data Processing Centers

The indicators characterizing the size of "data processing production" and the costs of its performance are showing a high growth rate (which undoubtedly results primarily from price changes).

Table 12. Value of Work and Services, Value of Sales and Cost of Work and Services in Data Processing Centers

	1976	1977	1978
1 W miliardach złotych			
2 Wartość prac i usług	7,9	10,2	12,6
3 Sprzedaż usług	4,2	5,3	7,0
4 Koszty wytworzenia prac i usług	6,8	8,9	11,2
Previous year = 100 / Rok poprzedni = 100			
2 Wartość prac i usług	.	128	123
3 Sprzedaż usług	.	126	134
4 Koszty wytworzenia prac i usług	.	131	125

Key: 1. Billion zlotys
2. Value of labor and services
3. Sales of services
4. Cost of performing labor and services

A positive phenomenon is a decrease in the growth of production costs compared to the growth of the value of labor and services and a reversal of the proportion in comparison with sales increases.

In the breakdown of costs of pabor and services in data processing centers, a decrease has been noted in the proportion of nonmaterial costs, including wage funds, along with an increase in material costs (amortization, foreign services, operating materials), among others.

Table 13. Breakdown of Costs of Performing Labor and Services in Data Processing Centers

Rodzaje kosztów 1	1976	1977	1978
2 Koszty wytworzenia ogółem	100,0	100,0	100,0
3 Koszty niematerialne	45,2	42,0	39,1
4 w tym fundusz płac	30,8	29,2	27,5
5 Koszty materialne	54,8	58,0	60,9
6 w tym: usługi obce	15,7	15,4	16,2
7 amortyzacja	22,2	26,6	28,9
8 materiały eksploatacyjne	9,1	8,7	9,0

Key [to table on preceding page]: 1. Type of costs
2. Total production costs
3. Nonmaterial costs
4. Including wage fund
5. Material costs
6. Includes: foreign services
7. Amortization
8. Operating materials

In the value of services sold by the department, the largest proportion is for sale of services involving operation of computers (64.7 percent), while the figures are 7.6 percent for design services and 6.2 percent for software services.

9427
CSO: 2602

RELIABILITY RATE OF COMPUTER SYSTEMS DESCRIBED

Warsaw INFORMATYKA in Polish No 7, Jul 79 pp 5-8

[Article by Wit Drewniak, Statistical Processing Mechanization and Automation Administration, GUS [Main Statistical Office], Warsaw: "Reliability of the ODRA 1305 and R-32 Computer Systems"]

[Excerpts] The rapid growth of domestic output of computers has meant that the ODRAs and RIADs are more frequently being used in the most varied types of computation centers, for example those which previously used foreign equipment. After Polish computers are installed, comparison with foreign machines begins immediately. Workers in the operators' and technical services relatively quickly gain their own impressions of the reliability of the new computer, while the center management takes a relatively long time to realize that there are different classes of computer reliability.

The various reliability classes in the family of the Unified System of computers are discussed by B. Gliksman's article on the results obtained during operation of Unified System computers installed in ZETO Katowice (INFORMATYKA No 7-8, 1978). On the basis of the tables in that article we can calculate the time between failures T_m for periods of operation lasting a number of months.[1] This quantity had the following values for various computers in use at ZETO Katowice:

R-20 (first year of operation)	16.1 hours
R-20 (second year of operation)	52.8 hours
R-22 (first year of operation)	42.8 hours
R-32 (eleven months of operation)	11.1 hours
R-50 (nine months of operation)	10.5 hours.

Thus during the first year of operation the mean monthly times between failures at ZETO Katowice were in the vicinity of ten-odd hours, while in the second year they were in the tens of hours.

1. The times T_m for the machines at ZETO Katowice and the times T_λ for the machines at the Electronics Center, GUS, Warsaw were calculated by formula (1).

It should be stressed that the abovementioned article was a strong argument on behalf of the technical services in discussions with users who wanted to achieve mean times between failures amounting to several tens of hours in the very first year of operation without regard to the aliability class of the computer.

Reliability Indicators for Operation of Computers in OE GUS, Warsaw

We know from operating experience that absolute perfection of technical installations (or equipment) is unobtainable, and that these installations (particularly computer equipment, owing to the extreme complexity of design) are subject to breakdowns.

A dependable measure of the reliability of an installation (device, system) is the mean time between two successive failures in a certain period of operation. This time, T_{λ} ,[2] generally called the reliability indicator, is the mathematically determined average value of a random variable designating the time of correct operation between two successive failures of the installation. We use the formula

$$T_{\lambda i}=\frac{1}{m_i}\sum_{j=1}^{m_i}t_{ij}$$

where m_i is the number of recorded failures of the i-th installation in the period of operation in question and t_{ij} is the operating time for the i-th installation from the moment repair of the installation is completed after the preceding (j - 1) failure until the next (j-th) failure.

In 1978 the Electronics Center (EO) of GUS in Warsaw conducted reliability studies of the computer systems in operation there. The results of these studies are shown in the tables below.

The data presented indicate that the ODRA 1305 computers have a reliability indicator T_{ii} in the range of 20-30 hours for a year's operation, the R-32's have an indicator of 7-9 hours, and the ICL 1905 an indicator of about 50 hours with a decreasing trend (12 years of operation), while the figure for the ICL 1903A is about 100 hours. We note that for the same type of machine, namely the R-32, the results obtained by ZETP Katowice are in accordance with those achieved at OE GUS. It could not be otherwise, since reliability is unquestionably an internal property of the installation and not a function of servicing. Technical servicing may indeed worsen or improve the operation of a computer system, but it cannot change the internal characteristics of the system.

Let us now consider how the values of $T_{\lambda i}$ obtained for the ODRA 1305 and R-32 and for foreign computers compare with the standards in force in our country.

Standards and Breakdowns of the Reliability of a Computer System

According to sectorial standard BN-78/3108-03, the minimum value of $T_{\lambda i}$ for computer equipment is 100 hours.

---

2. Abbreviated MTBF (Mean Time Between Failures) in English.

Let us assume that a typical computer system consists of the following devices: 1 processor, 3 internal storage units (32 Kbyte each), 1 operator console (monitor), 1 disk storage control unit ("paired" type), 6 disk storage devices, 2 tape control units, 8 tape memory units, 2 line printers, 2 card readers, 1 paper tape reader and 1 paper tape punch.

In practice, backup equipment generally is operated rather than being disconnected while waiting for a breakdown)failure) of the main equipment. The repair of malfunctioning equipment takes place only after this equipment is disconnected. This system of operation corresponds to a parallel reliability breakdown for the computer system with a so-called reserve load without repair.

In assuming such a reliability structure for a computer system we consider that the above typical computer system also contains as backup equipment 1 32 Kbyte memory block, 1 disk storage control unit, 1 disk storage device, 1 tape control unit, 2 tape storage units, a printer and 1 card reader, and that at a given time only one unit of a given type fails.

Case 2

The suppliers or producers of domestic computer equipment give the following values of T_λ for different devices:

--ODRA 1305 mainframe with 32K main storage	120 hours
--operator console (Facit or DZM 180/05)	1500 hours
--disk storage control unit (pds 325)	1000 hours
--disk storage device (Bulgarian-produced)	1000 hours
--magnetic tape control unit (MTS25-02)	450 hours
--magnetic tape storage unit (PT-3)	500 hours
--line printer (DW 325)	1000 hours
--card reader (CK 325)	450 hours
--paper tape reader (CDT 325--reader section)	500 hours
--paper tape punch (CDT 325--punch section)	200 hours.

For the above data, the value obtained for the average time between two successive failures of a domestically-produced computer system $T_{\lambda ws} = 37.0$ hours.

Case 3

According to data given in DATAMATION No 9, 1978, current typical values of T_λ for individual computer units in foreign countries are as follows:

--processor	1000 hours
--internal storage, 1 Mbyte	4000 hours
--disk or tape control unit	3000 hours
--disk storage device	2500 hours
--tape storage unit	1000 hours
--line printer	300 hours.

Without excessive error we can assume that T_λ is 500 hours for a paper tape reader, 450 hours for a card reader, 250 hours for a paper tape punch and 1500 hours for an operator console.

ODRA 1305, Factory number 208, second year of operation

	Miesiąc/rok		01/78	02/78	03/78	04/78	05/78	06/78	07/78	08/78	09/78	10/78	11/78	12/78
2	Łączny czas pracy [h]	t_p	543	504	568	510	516	559	543	575	575	603	538	488
3	Łączny czas awarii [h]	t_a	10	17	15	25	18	16	9	38	8	13	40	24
4	Liczba przestojów awaryjnych	m_i	37	31	43	43	58	33	16	27	32	29	32	42
5	Średni czas między uszkodzeniami [h]	$T_{\lambda i}$	14,2	15,7	12,8	11,2	8,6	16,4	33,8	19,8	17,7	20,3	15,5	11,0

The value of $T_{\lambda i}$ for a year's operation was 14.8 hrs in 1978 (15.1 in first year of operation).

ICL 1903A, Factory number 431, ninth year of operation

	Miesiąc/rok		01/78	02/78	03/78	04/78	05/78	06/78	07/78	08/78	09/78	10/78	11/78	12/78
2	Łączny czas pracy [h]	t_p	552	525	586	520	515	569	549	577	584	603	550	479
3	Łączny czas awarii [h]	t_a	—	3	2	15	6	5	—	1	—	—	1	5
4	Liczba przestojów awaryjnych	m_i	2	4	5	5	5	5	2	3	—	3	4	4
5	Średni czas między uszkodzeniami [h]	$T_{\lambda i}$	276	130,5	116,8	171	101,8	112,8	274,5	192	584	201	188	118,5

The value of $T_{\lambda i}$ for a year's operation was 160.2 hrs in 1978 (55.9 hrs in previous year)

Key (both tables): 1. Month/year; 2. Total operating time (hrs); 3. Total down time (hrs); 4. Number of shutdowns; 5. Mean time between failures (hrs)

ICL 1905, Factory number 201, twelfth year of operation

1	Miesiąc/rok		01/78	02/78	03/78	04/78	05/78	06/78	07/78	08/78	09/78	10/78	11/78	12/78
2	Łączny czas pracy [h]	t_p	552	514	570	510	508	561	541	575	534	553	528	486
3	Łączny czas awarii [h]	t_a	4	5	44	11	3	15	5	4	3	2	4	14
4	Liczba przestojów awaryjnych	m_i	18	12	40	7	6	17	11	10	11	6	9	11
5	Średni czas między uszkodzeniami [h]	$T_{\lambda i}$	30,4	42,4	13,3	71,2	84,1	33,1	48,7	57,1	48,2	91,8	58,2	42,9

The value of $T_{\lambda i}$ for a year's operation was 40.0 hrs in 1978 (72.5 hrs in previous year)

ODRA 1305, Factory number 197, second year of operation

1	Miesiąc/rok		01/78	02/78	03/78	04/78	05/78	06/78	07/78	08/78	09/78	10/78	11/78	12/78
2	Łączny czas pracy [h]	t_p	375	335,5	375,5	363	348	393	360,5	308	444,5	552	537,5	486
3	Łączny czas awarii [h]	t_a	37	67	6,5	10	14	13	14	17	10	10	20	44
4	Liczba przestojów awaryjnych	m_i	24	23	9	8	10	25	12	15	7	15	15	64
5	Średni czas między uszkodzeniami [h]	$T_{\lambda i}$	14,0	12,1	41,0	44,1	33,4	15,2	28,8	23,4	62,0	36,1	34,5	6,9

The value of $T_{\lambda i}$ for a year's operation was 20.7 hrs in 1978 (23.3 hrs in previous year)

Key (both tables): 1. Month/year; 2. Total operating time (hrs); 3. Total down time (hrs); 4. Number of shutdowns; 5. Mean time between failures (hrs)

ODRA 1305, Factory number 233, second year of operation (worked only 4 months in previous year)

1	Miesiąc/rok		01/78	02/78	03/78	04/78	05/78	06/78	07/78	08/78	09/78	10/78	11/78	12/78
2	Łączny czas pracy [h]	t_p	375	336	376	363	348	393	361	399,5	454	552	520	484,5
3	Łączny czas awarii [h]	t_a	4	13	5,5	10,5	9	5	4	5,5	2	3	7,5	4
4	Liczba przestojów awaryjnych	m_i	15	18	11	16	12	20	13	12	7	8	5	29
5	Średni czas między uszkodzeniami [h]	$T_{\lambda i}$	24,7	17,9	33,6	22,0	28,2	19,4	27,4	32,8	64,5	68,6	104,3	16,4

The value of $T_{\lambda i}$ for a year's operation was 29.4 hrs in 1978.

R-32, Factory number 021, second year of operation (worked 8 months in previous year)

1	Miesiąc/rok		01/78	02/78	03/78	04/78	05/78	06/78	07/78	08/78	09/78	10/78	11/78	12/78
2	Łączny czas pracy [h]	t_p	180	175,5	191	192,5	183	202	195,5	201	183,5	195	180,5	187
3	Łączny czas awarii [h]	t_a	33	45	16,5	19,5	58	20,5	53	32,5	75	23,5	30	5,5
4	Liczba przestojów awaryjnych	m_i	15	13	8	20	20	16	35	22	31	17	18	43
5	Średni czas między uszkodzeniami [h]	$T_{\lambda i}$	9,8	10,0	21,8	8,6	6,2	11,3	4,0	7,6	3,6	10,0	8,3	4,2

The value of $T_{\lambda i}$ for a year's operation was 7.1 hrs in 1978 (8.8 hours in previous year).

Key (for both tables): 1. Month/year; 2. Total working time (hrs); 3. Total down time (hrs); 4. Number of shutdowns; 5. Mean time between failures.

From the above data we obtain for the average time between two successive computer system failures (Western) the value $T_{\lambda ws} = 72.3$ hours.

Preliminary Analysis of Calculation Results

If we compare the actual values of $T_{\lambda 12}$ (see tables) for ODRA 1305 computers (20-30 hours) and R032 computers (7-11 hours) with the value of $T_{\lambda ws\ min}$ which we have obtained, we again confirm that the theoretical calculations are in accordance with operating experience. The ODRA 1305 computers are considerably above the lower limit for T_{λ} (11.7 hours) calculated for a typical computer system on the basis of the sectorial norm, while the R-32's from ZETO Katowice and OE GUS Warsaw are lower than this minimum value.

A comparison of the value of $T_{\lambda ws}$ (37.0 hours) calculated on the basis of the values of T_{λ} declared by domestic computer equipment producers with the actual values of $T_{\lambda 12}$ (20-30 hours) is unfavorable even for the ODRA 1305. This indicates either incorrect theoretical calculations by the designers of the equipment or underestimation of the problem in the production process. Those who find all fault to be with the system users, i.e. in bad practice by technical services personnel, may be given the reply that foreign machines serviced by the same technical personnel stand up to all comparisons with the theoretical calculations, and in practice even surpass (in a positive sense) the theoretical assumptions.

It is important to add here that the value $T_{\lambda min} = 100$ hours laid down in the sectorial norm for computer equipment is too little of a mobilizing influence for the producers of this equipment, and accordingly in the development of the Polish Standard the threshold values should be raised considerably.

In conclusion it is worthwhile to direct attention to the question of computer system software and to availablity of spare parts. Software (system, utility and diagnostic) and spare parts are unquestionably an integral part of a computer system and accordingly must be treated on the same plane as hardware. In out operating experience, unfortunately, this is not borne out, for spare parts are chronically in short supply and software is only partly modernized, and that with great delay.

9427
CSO: 2602

SCIENTIFIC CONTRIBUTION TO NATIONAL DEFENSE OUTLINED

Warsaw NAUKA POLSKA in Polish No 3, Mar 79 pp 3-12

[Report delivered at the scientific session commemorating the 35th anniversary of the Polish People's Army on Nov 15, 1978, in Warsaw by Jan Kaczmarek, ordinary member and scientific secretary of Polish Academy of Sciences]

[Excerpts] Scope, Methods and Forms of Cooperation

During the last two decades a system of cooperation has been developed between the scientific establishment and the army. It covers a broad range of joint activities in scientific research, scientific forecasting and expert assessment, and in education and training of research manpower.

The organizational framework and the forms and methods for collaboration between the army and the scientific community were outlined in an agreement between the Polish Academy of Sciences [PAN] and the Ministry of National Defense [MON]. The agreement is predicated on the principle of partnership between military schools and institutes and the civilian schools and research institutes of PAN and other ministries, especially the MNSzWiT [Ministry of Science, Higher Education and Technology], the Ministry of Health and Social Welfare and the Ministry of Machine Engineering.

The skeletal structure of the most important area of cooperation in scientific research is provided by a national system of research programs, including a PAN-coordinated basic research program, which cover specified portions of governmental programs and key research problems or separate interministerial problems.

Almost all problems included in the basic research plan cover topics that are intended to serve national defense and broadly conceived needs of the national economy. Topics of both kinds are shared by the centers of PAN and educational ministries and by the military schools and military research centers.

Typical of the joint effort of civilian and military scientists are extensive interdisciplinary programs of research in space and in earth's polar regions.

Joint endeavors of military and civilian research workers and experts under the national and interministerial Interkosmos research program culminated this year in a series of successful experiments during the first manned space flight with a Pole on the crew.

An important area of cooperation evolved under the governmental program of electronic applications in Poland. The search for new materials and subassemblies has led to close collaboration of the PAN Physics Institute with the Military Institute for Armaments Technology and the Military Technical Academy.

Another important area of cooperation is in the training and improvement of research manpower.

The PAN-MON agreement provides for MON employees' admission to doctoral programs and studies qualifying for assistant professorship in PAN institutions. Their participation is widespread in PAN's symposia, courses and training sessions, as exemplified by many years of MON participants' attendance in applied mathematics courses conducted by the PAN Mathematics Institute. Mention should be made of training sessions organized by the Military Technology and Research Development Command and Machine Building Committee as well.

A group of nearly 200-strong military scholars takes part in evaluations and forecasting work done by the PAN scientific committees. Military participants actively contribute to scientific sessions organized by those committees and to scientific publications on the state and results of research, significantly aiding in the integration of civilian and military scientific communities.

PAN professors and lecturers conduct educational and research activities in academic schools and institutes subordinated to the MON.

Other forms of cooperation should be mentioned as well, including the army's provision of substantial assistance in technology, materials and transportation, which was crucial to the organization of many scientific expeditions and experimental research stations abroad.

Achievement in Biological, Agricultural and Medical Sciences Reviewed

I will now deal with a group of sciences that are moving to the forefront of contemporary scientific advances. I am referring to the biological sciences that can take pride in considerable achievement in Poland as well as elsewhere, especially in molecular, environmental and theoretical biology.

Here are several examples of Polish biology's direct impact on and contribution to national defense.

Of tangible and measurable importance for the army was the PAN Antropology Division's completed anthropometric survey of the officer corps and enlisted

men, which will provide for more efficient development of uniforms for soldiers in more than a dozen age groups.

The arsenal of modern weaponry has no lack of radiobiological weapons. We must be prepared to overcome the effects of their use. In this connection, emphasis should be placed on research in ionizing radiation effects on cellular and subcellular structures.

Especially noteworthy is the army's steady assistance in providing qualified specialists and equipment and continuous consultation in the organization of scientific expedition and in the establishment and expansion of H. Arctowski Memorial Antarctic Station of the PAN in 1976-78, modernization of the PAN station in Hornsund, Spitsbergen in 1978 and refitting the PAN A. Dobrowolski Station in the antarctic in 1978.

The launching of the modern polar research program has provided opportunities for performing experiments of vital importance for aviation and spaceflight medicine, especially in the area of psychophysiology under extreme conditions. The program also opens new vistas for the development of maritime economy, thus being of significance for the national economy, science and national defense.

We are aware of the fundamental importance of agriculture and the food sector in times of peace and war.

With regard to the intensification of agricultural production, it is noetworthy that studies have been completed in the assessment of productive farmland. This will permit improvement in agricultural planning along with efficient regional breakdown of plant production.

A scientific basis has been developed for gradual transition from multidirectional traditional agriculture to specialized agriculture. This should bring about a reduction in the number of cultivated crops and concentration on several (10-12) most valuable crops in plant production. Scientific crop selection will also have tangible effects in altering the composition of plantings of major crops in Poland.

New, high-yield crop varieties and fully mechanized modern cultivation techniques are being introduced in farming. Substantial advances are noted in orchard and vegetable cultivation.

Considerable research efforts are being undertaken to increase animal production. Promising results have been achieved in genetic research on stock improvement. A method for proper assessment of breeding potential in farm animals has been developed and applied in stock breeding, and a technological process for quantity animal production has been developed.

Important results of studies in the prevention and eradication of contagious diseases permitted elimination of cattle tuberculosis while studies

in improvement of sanitary wuality of animal foodstuffs made possible the detection of toxic substances and removal of radioactive contaminants.

Results of value for national defense were achieved in food production engineering.

Our system's crucial value is human health and comprehensive development. In recent years we undertook to implement a long-range health protection program. It incorporates several major research programs including those having the rank of governmental programs as does the neoplastic disease prevention program.

Among the lines of development in medical sciences and the results of studies currently under way, I will mention those meriting especial emphasis from the standpoint of national defense.

Outstanding results, underscored by state awards, were posted in immunology, neurobiology and pharmacology. Especially valuable from our point of view are the results in transplantation science, brain edema and hypoxia, and new psychotropic and neurotropic drugs.

The second research field of high theoretical and practical importance includes studies in the mechanisms of adaptation to exertion and heat, helpful in evaluating human capacity for work or combat action.

The third area of particular interest for us includes studies in community medicine and epidemiology, where impressive results have been achieved. Tuberculosis, a formidable contagious disease in the past, has been eradicated and major advances were noted in containing many other contagious and noncontagious diseases which is of fundamental importance for improving the general level of health.

Important for national defense are recent advances in clinical sciences including surgery, cardiology, transfusion and many subdivisions of clinical pathophysiology. Noteworthy results have been attained in the treatment of burns and infections, and in aviation and space-flight medicine. Similarly, emphasis should be placed on the vital participation of the Military Institute for Aviation Medicine in the preparations for and the carrying out of the first Polish space flight.

Also, attention should be drawn to advances in three other areas of intensive research: The health-related aspects of food production, occupational, social and medical rehabilitation and mental health and psychological hygiene.

Examples of Activities in the Exact and Technological Sciences

The army and the scientific community cooperate importantly in such fundamental disciplines as mathematics, physics and chemistry, as well as in a number of technological sciences.

Educational and research activities of our mathematicians, including those associated with the PAN Mathematics Institute, enhance mathematical applications in all the sciences and the economy, which is reflected in the country's improving educational potential.

In physics, three groups of problems, coordinated by the PAN Physics Institute, merit attention.

The first group includes research targeted on quality improvement in materials and quality and reliability improvement in semiconductor devices. In this connection, mention should be made of research projects involved in the preparation of crystallization of ternary materials under weightlessness as well as the completion of the Syrena experiment in the Salyut orbital station as part of the Inter cosmos program.

The second set of studies focus on new semiconductor materials with a narrow power gap. Especially interesting in this area are studies in the sources and sensors of infrared radiation.

The third group includes studies in the manufacturing technology and production engineering of microwave devices. These include research in the propagation of both continuous and pulse waves of very high frequencies in microwave structures with ferrite components, wave propagation in epitaxial layers layers of magnetic materials, and, finally, design and development of a high-power circulator and microwave power monitors to the X and S bands. Prototype versions of the latter have been made available to the RawarWZR [Warsaw Radio Plant].

Of significance for the country's defense are theoretical and experimental studies in wave parameters of ferrite strip lines that have resulted in the development and design of model microwave devices based on strip lines. Equally valuable results have been achieved in the studies of very high frequency wave propagation in a medium containing plane parallel dielectric layers, and in the study of the influence that model antenna radar shields, made from such layers, exert on principal characteristics of radar antennas.

Contributions from military institutions, including the Miliaary Technical Academy and the Army Institute of Weapons Technology, were noteworthy in the completion of these studies.

As part of a key problem coordinated by the PAN Institute of Physical Chemistry, several methods for the detection and determination of toxic substances in the atmosphere were tested with the participation of the Military Institute of Chemistry and Radiometry. The research tasks that have been successfully completed include the development and production of a laser radar for detecting aerosols in the air, a flame emission analyzer detecting sulfur and phosphorus compounds and a radiation-luminescent precision absorption meter for the detection of choline-esterase inhibitors.

The PAN Organic Chemistry Institute had a major part in the development of the synthesis and production engineering of cyanoacrylic tissue adhesives, tested and applied in military surgical clinics. The institute fruitfully cooperates with the Military Institute of Hygiene and Epidemiology on preventive medicine and treatment of pesticide poisoning.

In an effort to meet the needs of the Engine Fuel and Lubricants Service Command, the PAN Polymer Division has developed a new synthetic compound based on domestic raw materials, a fact which made the army independent of the supply of imported resin. Production engineering techniques have been developed and applied in resin synthesis and in resin storage containers. Considerable savings are being realized thanks to this production, as containers of this kind are widely used by the army. As part of a key problem coordinated by the PAN Polymer Division, joint research on grafting polymer foils to endow them with desired properties has been conducted with the participation of the MON Military Institute for Chemistry and Radiometry. A new type of polyester-polyurethane laminate with high-utility parameters has been developed. The principles of this production engineering technique were conveyed to the Stomil Rubber Industry Plant in Grudziadz where regular production has been started. The product will have military and civilian applications as protective sheathing.

Wide-ranging cooperation and valuable results should be placed on record in the area of earth sciences and in space research.

The needs and requirements of Poland's defense are given broad consideration in the activities of the PAN Geography and Territorial Development Institute. They cover defense-related aspects in the planning of spatial development, problems of resources in and durability of physical structures and their protection from defects and natural disasters. There is a long-term connection between the country's defense and geological discoveries, including those resulting in the documentation of iron, titanium and vanadium ore deposits in the Suwalki region, and the expert assessment of the country's natural resources and fuel and energy industry.

The public shows considerable interest in and appreciation for space research, culminating in the successful K pernik 5000 experiment of 1973 as well as in the participation of the first Pole in a manned space flight. Numerous significant research programs were completed in 1978 as well. It would certainly have been impossible to implement the extensive space research program without a substantial input from military research institutions. The Military Communications Institute participated in the development of methods for transfer and numeric processing and utilization of geophysical information in communications, meteorology, navigation and remote sensing. The Military Institute for Aviation Medicine worked on a number of topics in biology and space-flight medicine. The Military Technical Academy took part in the development of ionospheric models to be used in determinations of parameters for satellite communication.

The Topographical Directorate of the Army General Staff participated in design work in satellitary geodesy and construction of laser equipment for measuring distances to earth's artificial satellites.

Space research currently includes four areas: Communication and radio-wave propagation, geodesy and space-object tracking, studies of terrestrial surface from outer space and aviation and space-flight medicine.

Research in technological sciences is of fundamental importance for defense. Several programs are jointly implemented by PAN centers, university centers and ministry sectorial institutes, with substantial contributions from the military institutions such as the Military Technological Academy and the Military Institute of Armor and Vehicle Technology.

Valuable results have been obtained under a research program devoted to integrated production engineering computer control systems, now being applied in major industrial plants, including the Katowice Steel and Iron Works.

Owing to the participation of the Naval Marine Higher School, groundbreaking results were achieved in the study of an "Integrated system for remote control of vessels on the basis of applications of Polish-made equipment."

A part of the problem labeled "Durability and Optimization of Machinery and Construction Structures," work is in progress to identify new design methods for machines and architectural structures and to improve existing methods. Industry and construction are increasingly interested in the results already obtained, in particular, in calculation programs for digital computers, and permissible-load and experimental methods. Several dozen industrial plants, industry and construction research centers and military institutions applied for access to these results in 1977.

Of considerable importance is the development of prototypes for a number of new devices for experimental research, including creep-testing machines to test metals under compound stress, a polariscope for testing structural stress by photoelastic coverage methods, a helium cryostat for testing properties of metals in very low temperatures and a photoelastic micropolariscope. The Military Technical Academy had an outstanding contribution in the accomplishment of research tasks included under this problem.

A wide range of research topics, pursued under the overall problem "Advances in Methods and Means of Plastic Deformation by Machining, Grinding and Erosion," yield results that have had or will have a direct influence on military technology. Among them are research projects pertaining to physicochemical and mechanical phenomena occurring in coacting parts, important for operational reliability and durability of weapons and other types of military equipment.

In keeping with this, long-term directions outlined by the 12th plenum of PZPR Central Committee advance to the forefront of scientific research. They include a comprehensive development program in the power industry, a program for computerization and automation of production processes, a development program in materials engineering, a program for chemistry development in the national economy and the elaboration of a set of interrelated undertakings covering all stages in the development of individual, environmental and human activity promoting the training of personalities of Poles in the era of developed socialism.

An important task, defined by the 12th plenum, is the development of Polish industry to manufacture research equipment and devices for automation of research. This is not only a precondition for increasingly effective scientific research but also a precondition for quality improvement in all industrial production. Research equipment, especially medical apparatus, poses a problem that is very closely related with the requirements of national defense.

8795
CSO: 2602

MILITARY CONTRIBUTION TO SCIENTIFIC, ECONOMIC DEVELOPMENT DESCRIBED

Warsaw NAUKA POLSKA in Polish No 3, Mar 79 pp 13-20

[Article by Gen Florian Siwicki, chief of general staff of the Polish Army, vice minister of national defense]

[Excerpts] The scientific session organized by PAN to commemorate the 35th anniversary of the Polish Army is devoted for the most part to those problems in the activities of both civilian and military institutions in which the concerns of national defense and Poland's socioeconomic development are interlocked in one indivisible entity.

We have considerable achievements in disciplines comprised in the science of war and military technology and in other disciplines interrelated with these. Through creative use of our Polish attainments, along with the achievements of the Soviet science of war, we have advanced to a status of modernity and reached a high level in combat effectiveness of our armed forces.

In the area of command and control of troops we are developing the military theory of organization and control as needed to meet contemporary military requirements; we have initiated systems research in the automation of command and control processes; we are applying computerized-information systems for the collection, selection and processing of data and we are establishing and improving information banks to meet our needs. We continue to reinforce the army's traditional features of exemplary, organized work and discipline and we imbue the army with modernity so that it can become a good school for organized action, instilling habits of efficient performance. This is a good opportunity to note the participation of military scientists in the development and industrial application of a wide range of computers, microcomputers and data transmission devices, received with appreciation by various sectors in the national economy.

Originating from the needs of modern combat equipment and vigor :sly advancing at this time, military meteorology benefits from collaboration with PAN and other sectors' research centers in contributing to render increasingly precise [information on] the country's weather conditions. This is

indicated by the extent of typical activities in meteorology, including applications of methodology for utilizing meteorological satellite photography, automation of the processing of meteorological radar data for a military-civilian network of stations on the country's territory, the application of a computerized information system for developing aviation/climatological characteristics of Poland's territory, and tentative applications of modern computer techniques in forecasting individual atmospheric phenomena.

Work in communications, now being conducted jointly with the PAN, significantly contributes to science and the national economy. Most noteworthy are research studies in electromagnetic wave propagation. Radio forecasts based on this research are used in the planning of long-range, shortwave radio links and selection of optimal radio frequencies, substantially improving radio communication.

In space research, besides their activities involved with the preparation of Poland's first cosmonaut, Lieutenant Colonel Hermaszewski, under the Interkosmos program, our scientists collaborate with military specialists in the implementation of a research program in outer space and circumterrestrial space and their uses, especially in satellite radiocommunication. Their successful collaboration was crowned with practical applications of processing methodology for ionospheric forecasts, digital modeling of ionospheric and circumterrestrial plasma characteristics, and ongoing monitoring of the ionosphere, magnetism and solar parameters.

In geodesy and cartography, military science and practice interlinks with Polish science and the national economy on many levels. Jointly conducted cartographic measurements in gravimetry and terrestrial magnetism provide scientifically valuable representation of surface distribution of the earth's gravitational and magnetic fields. There is a civilian and military system for recordkeeping and updating of mutual informative geodesic data (referred to as banks of coordinates). Access is provided to indispensable materials in military topographic maps for the preparation of a civilian edition of maps in various scales. Maps are updated by photogrametric methods and air photographs are transmitted to the civilian service for use. A light portable geodesic mast and a microwave range finder used for rapid measurements over distances of several tens of kilometers have been developed and have won a high rating with the civilian geodesic service.

A special achievement of this half decade was a joint effort of the MON and research institutions of interested ministries in undertaking numerous research projects concenred with the protection of population, physical assets and national c lture in a situation of impending war. Implemented by the organizational units of territorial defense, these activities interrelate defensive needs with a search for effective countermeasures in cases of various perturbations and life-and-environment-imperiling failures that occur in technological processes, most frequently in heavily industrialized urban areas of the country.

The devotion and talents of science and technology personnel, protection offered by the socialist state and Soviet cooperation and assistance caused the scientific and technological advancement in the armed forces to be marked by exceptional vigor.

Our achievements in quantum electronics are well known domestically. They offer prospects for accelerated development of laser technology, currently applied with increasing frequency in diverse areas of socioeconomic activity. A wide front of activities on solid-state physics pursued within the military technical support base, along with the results already obtained, are opening new prospects for advances in materials engineering. Research in explosives not only has been reflected in fundamental studies on the physics of explosions but has also led to the development of new gel explosives, widely used in mining now.

Particularly noteworthy is the newly designed, fully automated vessel power plant, a unique solution worldwide, to be used in the merchant marine.

We are advancing into broad research activities, with considerable assistance from civilian research centers, in the operation of technological systems and appliances which represent a contribution to the theory of operation. Its further advancement should bring about continued improvement in the utilization of diverse, complex technological equipment. How important for the country these topics are is indicated by their being ranked as a key problem.

Our design activities and experimentation in mechanized vehicles, and aviation engineering equipment, radar, communications and remote information systems have brought a definite measure of stimulation into the growth and advancement of the country's industrial base.

As far as biomedical sciences are concerned, an exceptionally significant combination of cognitive and practical issues arises in the contact zone between these sciences and modern science. A particularly elevated level of complexity in the military equipment and technological systems requires suitable studies in hygiene, physiology, psychology, ergonomics and military service. Scientific research centers of the military health service are working on these issues in close collaboration with PAN and the centers of other ministries.

Especially worthy of mention are combinations of problems in work hygiene and physiology and in environment-oriented medicine concerning human performance under extreme psychophysical stress. Numerous detailed and synthetic studies have been completed in aviation and space-flight medicine, in underwater medicine and in other areas involving body capacity and adaptation under varying conditions of work and service.

A large group of studies, dictated by the needs of the army but at the same time addressing the needs of the national economy and civilian defense,

is concerned with protection against radiation of various kinds. A systematic program of microwave protection, developed along with the application of appropriate methods and means of individual protection, won a second-class state award in 1979.

At the same time, consistent activities are being conducted whose purpose is to find and identify new methods of protection against ionized radiation and poisoning by highly toxic chemical compounds and to find new methods for prevention and treatment of contagious diseases.

The military health service has developed and put into practical use an intensive medical-care system, including cardiovascular diseases that rouse especial concern in society.

Modern civilization's problem of how to combat neplastic diseases has not been solved. Our institutions actively participate in the implementation of the governmental program for these diseases that threaten mankind.

We are now taking part in the fifth scientific session of the PAN whose leadership always invites a good number of MON representatives for a joint assessment of our contribution to scientific progress and socioeconomic development of our socialist fatherland and for defining directions for future actions.

The fourth session of November 1973 advanced nearly 70 motions and proposals for elaboration. Of these, eight concerned operations problems, two--organizational problems, 19--social and political problems, 15--health services and quartermaster services and 19--technological problems.

Those submitted motions and proposals--with few exceptions--were taken into consideration in the key and interministerial problems planned by the government for development by 1980. This range of problems is consistently expanded every year owing to the study of comprehensive problems by particular PAN centers and scientific committees and by military institutions. Work done on these problems and the totality of planned research is regularly evaluated in conferences of the PAN and MON leadership.

It gives me satisfaction to state that the PAN institutions and scientific committees are extremely helpful and understanding in their handling of the need for improving our country's defense system. When submitted, defense-related problems always are accommodated in the plans and budgets of scientific research conducted independently by PAN centers or jointly with the military institutions.

Let me here convey my warm thanks to the PAN leadership for their complete understanding and provision of accommodating terms of cooperation, and let me thank the leaders of PAN scientific committees, institutes and subdivisions for their accomplishment of research on problems involving national defense.

We highly appreciate, in particular, our collaboration with space research, "Poland 2000," territorial development, and geodesy scientific committees, experimental and clinical medicine, molecular and macromolecular research centers, institutes for fundamental problems in technology, physics, history, and physical chemistry, and the divisions of polymers, comprehensive automation systems and anthropology.

8795
CSO: 2602

END

END OF
FICHE
DATE FILMED

15 Jan 1980

DD.